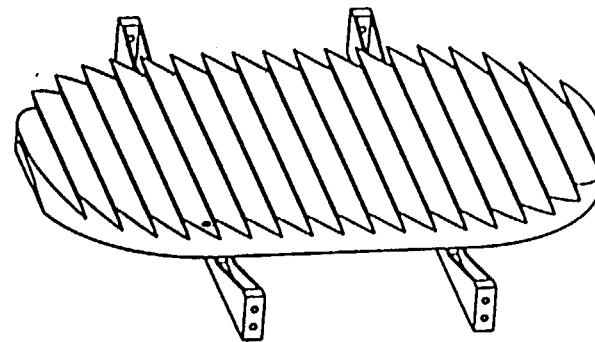


# *The MODIS On-Board Blackbody*

## *Predicted Emissivity*



Dan Knowles Jr.

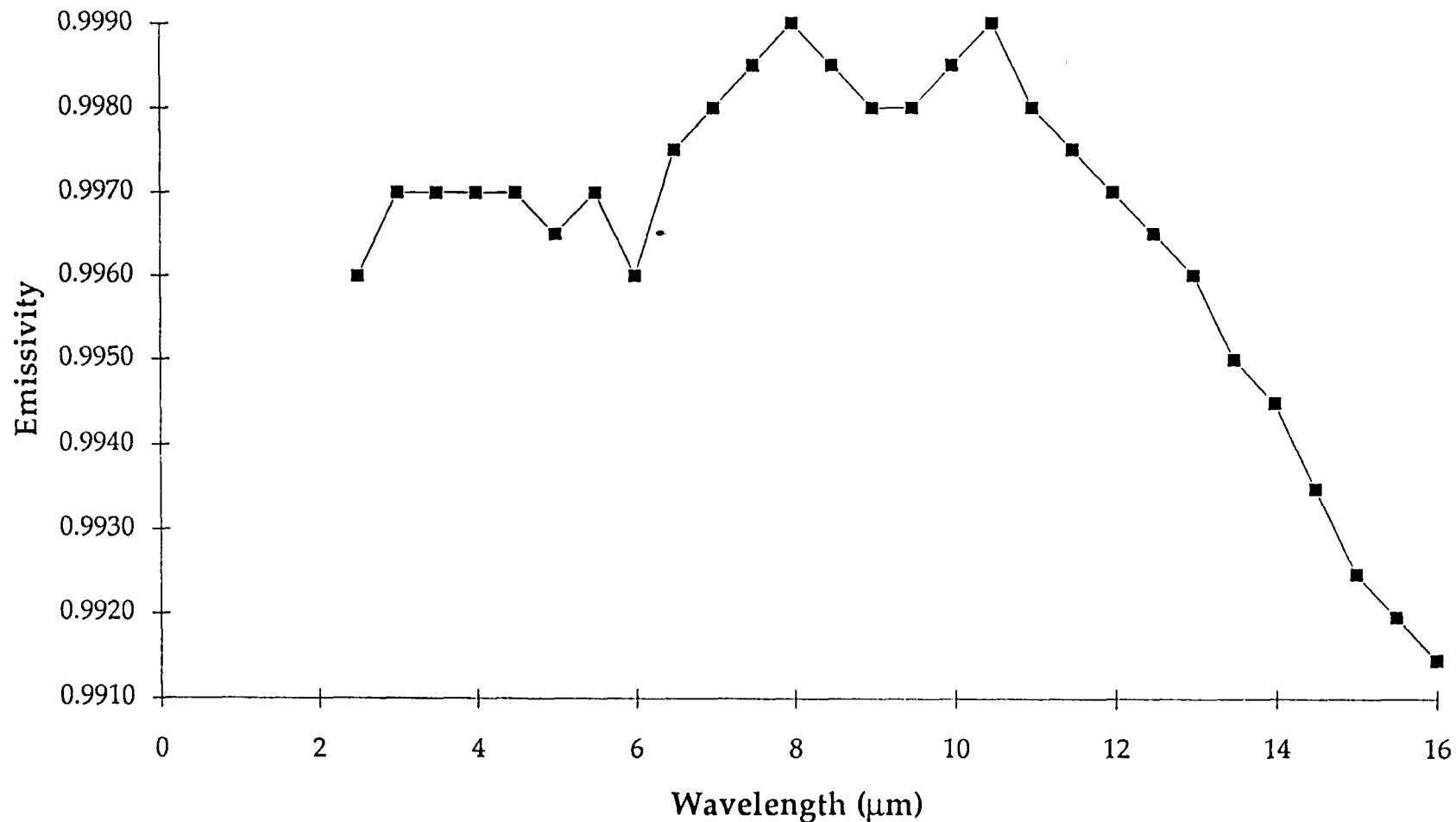
*MODIS Algorithm Team Meeting  
2 Mar, 1994*

# *MODIS Blackbody*

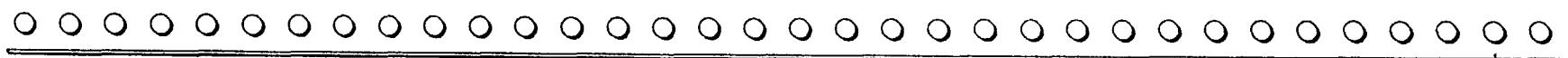
## *Emissivity vs Wavelength*



- Calculation based on type II anodized aluminum data applied to the SBRC emissivity equation



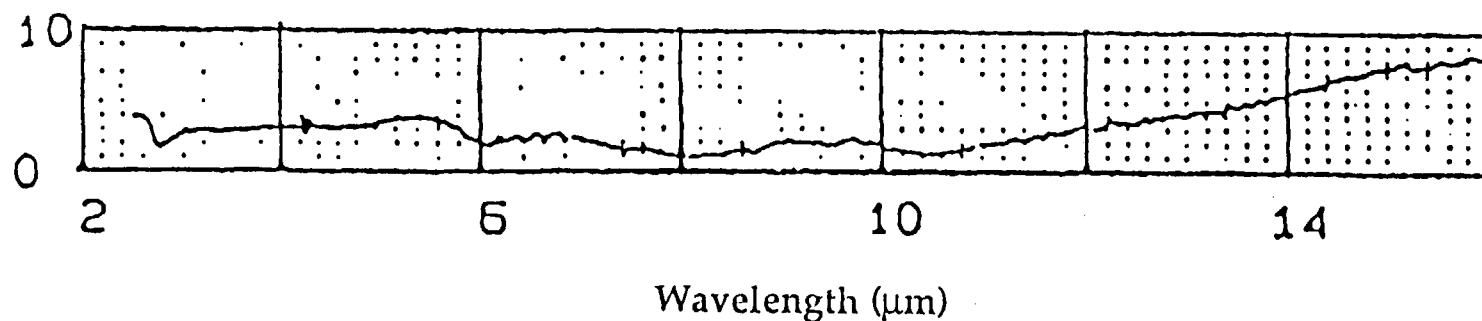
# *Reflectance of Black Anodized Aluminum*



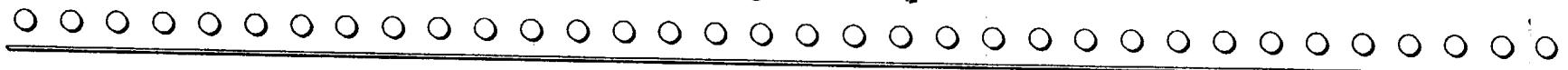
Candidate Anodized Aluminum Material for MODIS Blackbody:

- 6101-T6
- 1100-H18
- 1100-annealed

*% Reflectance Plot of Type II Black Anodized Aluminum*



## *Derivation of V-Groove Blackbody Emissivity Equation*



$$\varepsilon(\lambda) = 1 - P(\lambda)$$

where;  $P(\lambda)$  = reflectance of blackbody

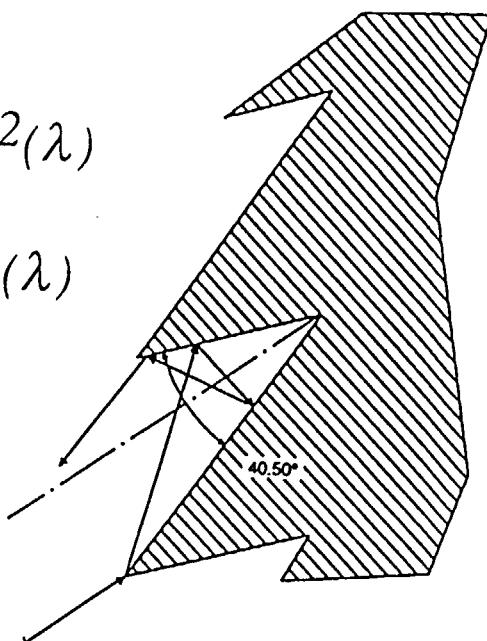
if light undergoes one specular reflection then  $P_1(\lambda) = \rho(\lambda)$

if light undergoes two specular reflections then  $P_2(\lambda) = \rho(\lambda)P_1(\lambda) = \rho^2(\lambda)$

if light undergoes  $n$  specular reflections then  $P_n(\lambda) = \rho(\lambda)P_{n-1}(\lambda) = \rho^n(\lambda)$

if light undergoes a variety of reflections with  $k$  as its maximum then

$$\varepsilon(\lambda) = 1 - \sum_{n=1}^k w_n \rho^n(\lambda)$$



## *Calculated Emissivity of the MODIS Blackbody*

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$$\varepsilon(\lambda) = 1 - \sum_{n=1}^k w_n \rho^n(\lambda)$$

$k$  = # of spectral reflections

$\rho(\lambda)$  = reflectance of black anodized aluminum

$w_1$  = 0.1 (10% weight for one specular reflection)

$w_4$  = 0.9 (90% weight for four specular reflections)

The MODIS V-groove blackbody is designed such that 90% of the reflected light undergoes at least four specular reflections. The remaining 10% undergoes at least one specular reflection. Therefore, emissivity can be calculated as follows:

$$\varepsilon(\lambda) \geq 1 - (w_4 \rho^4(\lambda) + w_1 \rho(\lambda))$$

## *Emissivity vs MODIS Band #*



• Calculation based on type II anodized aluminum data applied to the SBRC emissivity equation

